

Application No.: 10/700,295
Amendment Date: July 12, 2006
Reply to Office Action: April 7, 2006
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Amendment to the Drawings:

The attached sheet of drawings includes changes to Fig. 5A. This sheet, which includes Figs. 5A and 5B, replaces previously filed sheet including Figs 5A and 5B. In Figure 5A, question marks “?” had been replaced by the numeral 56. It is noted that the reference number 56’ denotes interconnect pieces. It is also noted that the reference number 56 denotes vias (holes within the electrolyte sheet) that contain interconnects 56.

The sheet of drawings includes words “Replacement sheet”.

Attachment: Replacement Sheet

REMARKS/ARGUMENTS

Drawings

The attached sheet 2 of drawings includes changes to Fig. 5A. This sheet, which includes Figs. 5A and 5B, replaces previously filed sheet including Figs 5A and 5B. In Figure 5A, question marks “?” had been replaced by the reference number 56’. The reference number 56’ denotes interconnect pieces. It is also noted that the reference number 56 denotes vias (holes within the electrolyte sheet) that contain interconnects 56’. (See paragraph [0048] of the Applicant’s specification.)

The sheet of drawings (sheet 2/11) includes words “Replacement sheet”.

Claim Status

Claims 1-28 remain in this application. Claims 1-3 have been amended. Claims 12-28 have been withdrawn as a result of an earlier restriction requirement. In view of the examiner’s earlier restriction requirement, applicant retains the right to present claims 12-28 in a divisional application. The Examiner indicated that claim 3 contains patentable subject matter, and will be allowable if rewritten in independent form.

Double Patenting/Terminal Disclaimer.

Claims 1-12 stand provisionally rejected over claims 10-16 and 23-25 of co-pending application No 10/611,507. Therefore, Applicants are filing, herewith, a Terminal Disclaimer to overcome the provisional rejection.

Claim 3

The Examiner indicated that claim 3 contains patentable subject matter, and will be allowable if rewritten in independent form. Accordingly, claim 3 has been rewritten as an independent claim and now incorporates the subject matter of the original claim 1.

Claims 1, 2 and 4-12 are rejected under 35 USC 103(a) as being unpatentable over US Publication 2003/0165732 A1 (McElroy) in view of US Publication 2001/0044043 (Badding) and evidenced by US Patent 4,874,678 (Reichner).

The establishment of *prima facie* case of obviousness required that **all of the elements be found in the prior art**. Accordingly, it follows that if **a single element is not found in cited art**, a valid *prima facie* case can not be established. Moreover, obviousness can only be established by combining or modifying the teachings of prior art to produce the claimed invention where there is a teaching, suggestion or motivation to do so found in the references relied upon. However, hindsight is never an appropriate motivation for combining references and/or requisite knowledge available to one having ordinary skill in the art. To this end, relying upon hindsight knowledge of applicants' disclosure when the prior art does not teach nor suggests such knowledge results in the use of the invention as a template for its own reconstruction. This is wholly improper in the definition for patentability.

I. The cited references, in combination, do not disclose all of the features of claims 1, 2 and 4-12.

Independent Claims 1 and 2 call for the "electrolyte sheet including a substantially homogeneously non-porous body of a varied thickness".

US Publication 2003/0165732 A1 (McElroy) does not disclose a substantially homogeneously non-porous body of a varied thickness. Although the McElroy reference teaches an electrolyte sheet with a textured surface, it does not disclose whether this body is homogeneously non-porous.

US Publication 2001/0044043 (Badding) also does not disclose this feature. More specifically, this reference teaches: (i) a non-porous electrolyte body (layer 4, see Fig. 2 of the reference) without thickness variation; and (ii) porous electrolyte body(s) (layers 2) that are roughened and that provide thickness variation. That is, this reference shows two bodies—one that is non-porous, but without thickness variation, and the other that has thickness variation, but is porous. Therefore, this reference does not disclose an electrolyte with a single body that is both non-porous and that has varied thickness.

The Examiner drew Applicants attention to paragraph [0003] of the US Publication 2001/0044043. This paragraph describes the entire electrolyte (layer 4 in combination with layer 2. However, even if we assume arguendo, that the entire electrolyte (with all of its layered bodies) can be viewed as one body, this electrolyte is not “homogeneously non-porous body of a varied thickness”, as claimed in Applicant’s claim 1, because it is made of porous and non-porous layers.

US Patent 4,874,678 (Reichner) discloses an electrolyte sheet that is non-porous (see Col.4, lns. 12-15, but does not disclose that it is substantially homogeneously non-porous, and does not disclose that it has a varied thickness.

Therefore, because the cited references, in combination, do not disclose all of the features of claims 1 and 2, claims 1 and 2 are not unpatentable over these references. Claims 4-12 depend from claim 1 as their base claim and, therefore, incorporate all the features of claim 1. Thus, claims 4-12 are also patentable, and are non-obvious, in view of these references.

II. Applicants claimed a specific orientation of the electrolyte sheet. The cited references do not disclose this orientation, nor provide a motivation or reason for doing so.

Claim 1 specifies “one side of said electrolyte sheet experiencing a predominately compressive force, the other side of said electrolyte sheet experiencing a predominately tensile force, wherein the side with a relatively smooth surface is subjected to the predominately tensile force and more textured surface subjected to predominately compressive force.”

US Publication 2001/0044043 (Badding) does not disclose this feature. US Publication 2003/0165732 A1 (McElroy) also does not disclose this feature. The US Patent 4,874,678 (Reichner) reference also does not disclose this feature. On page 4 of the Office Action the Examiner stated "Since only two choices exist, pointing the textured surface to the anode or cathode and the orientation is seen as rearrangement of parts, it would have been obvious to one of ordinary skill in the art at the time the invention was made to change the orientation of the electrolyte sheet to optimize the performance of the fuel cell, since it has been held that rearranging parts of an invention involves only routine skill in the art."

Applicants respectfully disagree. Absent applicant's teachings, why would some one think that changing the orientation of electrolyte (so that relatively smooth surface is subjected to the predominately tensile force and more textured surface subjected to predominately compressive force) would optimize the performance of the fuel cell?

None of the cited references teach or provide motivation for such improvement from electrolyte orientation, nor provide reasons for possible electrolyte failures. As stated above, hindsight is never an appropriate motivation for combining references and/or requisite knowledge available to one having ordinary skill in the art. To this end, relying upon hindsight knowledge of applicants' disclosure **when the prior art does not teach nor suggests such knowledge** results in the use of the invention as a template for its own reconstruction. This is wholly improper in the definition for patentability.

Absent a teaching of a problem and what causes a problem, it is not obvious that one can optimize of device performance by changing orientation of electrolyte sheet. That is, absent a teaching of what orientation will optimize the device performance, and the teaching of reasons for why orientation impacts the performance, in the cited references themselves, claim 1, and its dependent claims 4-12 can not be held obvious over the cited reference.

Paragraph [00104], Example 6, of the Applicant's specification teaches that "Applicant's found that if the electrolyte sheet has one textured and one relatively smooth surface, it is preferable for the electrolyte sheet to be oriented in a manner such that the textured surface

experiences predominately compressive forces. ... The surface features such as small defects and/or protruding features of the textured surface, when subjected to predominately tensile forces may result in stress concentration and tearing of these features. Therefore, it is preferable that the relatively smooth side of the electrolyte sheet, rather than the textured side, experiences predominately tensile forces." None of the cited references teaches this rationale for the proper electrolyte orientation. None of the cited references teach or suggest that the surface features such as small defects and/or protruding features of the textured surface, when subjected to predominately tensile forces may result in stress concentration and tearing of these features.

Appreciating the problem is part of the invention. Since the cited art failed to appreciate this problem (i.e., the problem of stress concentration and tearing of the features of the textured electrolyte surface when it is subjected under tensile forces, and the resultant effect on SOFC device longevity and/or performance), and provides no motivation for fixing the problem(s) the solution to the problem is also unobvious. It has long been held by courts that "The discovery of a problem calling for an improvement is often an essential element in an invention correcting such a problem; and although the problem, once realized may be solved by use of old and known elements, this does not necessarily negative invention" *In re Bisley*, 197 F. 2d 355, 94 USPQ 80, 86-87 (CCPA 1969).

Thus, since the cited references do not teach the problem to be solved, nor provides any reason for orienting the electrolyte sheet as claimed by Applicants, claim 1 is not obvious in view of these references.

On page 5 of the office Action, the Examiner stated that since "electrolyte of the prior art is made from the same material as the instant application, it would have similar features such as nonporous body." Applicants respectfully disagree with this statement for the following reasons. The Badding reference discloses two zirconia based electrolyte bodies (layers 2 and 4). One of them is porous and another one is not. Thus, just because a cited reference discloses a zirconia based (e.g., 3YZ) electrolyte body, it does not mean that the electrolyte body is substantially homogeneously non-porous.

Examiner's rejection of Applicant's claims 1, 2 and 4-12 based on 35 U.S.C. 103(a) is thus improper at least (i) because the combination of cited references do not disclose all of the elements of these claims, and (ii) for failing to provide a motivation for combination, and for failing to show a reasonable success of combination. Applicant accordingly traverses Examiner's rejections of claims 1, 2 and 4-12.

Claims 1, 2 and 4-12 are rejected under 35 USC 103(a) as being unpatentable over JP Publication 05-258756 (Kato) in view of US Publication 2003/0165732 A1 (McElroy).

I. Kato reference is directed to a different technology. The Examiner, on pg. 6 of the Office Action, stated that "Kato teaches texturing of only oxidant surface of a fuel cell electrolyte (Abstract)" and also stated that "As pointed out in applicant's specification, it is known to have a higher flow of air across the cathode creating a greater compressive force on the high pressure side (airside) and a greater tensile force on the fuel side. So it is inherent that the electrolyte taught by Kato that has the same characteristics as the instant invention and arranged in a similar manner, experiences the same predominately compressive force on the airside and tensile force on the fuel side." Applicants respectfully disagree with this assertion for the following reasons.

Applicants amended claims 1 and 2 to specify that the electrolyte is a ceramic electrolyte. This amendment is supported, for example, by paragraphs [0041] and [0070] of Applicant's specification. Thus, the Kato electrolyte is different from what is called for in claims 1 and 2. The Kato electrolyte does not have the same characteristics because it is made from a different material. Kato utilises an ion conductive polymer (NOT ceramic) and a polymer membrane based fuel cells cannot operate under the same conditions as solid oxide fuel cells (SOFCs) based on ceramic electrolytes. For example, fuel cells utilising proton exchange membranes made of polymers operate at temperatures below 100° (e.g. about 80 °C), while SOFCs based on a ceramic electrolyte typically operate at much higher temperatures of 600°C to 850 °C (see paragraph [0044]). A polymer based electrolyte sheet of Kato would not be subjected to the same thermal/mechanical stresses associated with cycling through much higher temperature extremes. More specifically, a polymer based electrolyte sheet of Kato, if subjected to these

higher temperatures would simply be burned up-i.e., destroyed! Thus, it is not inherent that the polymer electrolyte taught by Kato works in the manner of the ceramic electrolyte claimed in claims 1 and 2, nor that it is arranged in the manner claimed by Applicants, nor is it inherent that it experiences the types of pressures taught and claimed by the Applicants. Nor would one of skill in the art look to polymer based electrolytes to solve a problem associated with ceramic electrolytes. Accordingly, claims 1 and 2 are unobvious over the cited references. Furthermore, one Claims 4-12 depend from claim 1 as their base claim and, therefore incorporate the language of claim 1, accordingly, claims 4-12 are also not obvious in view of Kato and McElroy references. (It is noted that although the Kato reference is directed to fuel cell devices that utilize protonic exchange membranes made of polymers, the McElroy reference is directed to SOFC devices that utilize ceramic electrolytes. Thus, the two technologies are not compatible and the cited references themselves provide no reason for the substitution/modification suggested by Examiner).

II. Applicant's did NOT teach that prior art discloses "a higher flow of air across the cathode creating a greater compressive force on the high pressure side (airside) and a greater tensile force on the fuel side." Applicants were discussing the embodiments of the present invention and what how these embodiments typically operate. That is, the Examiner is pointing to the discussion under the Detail Description of Preferred Embodiment, and more specifically, that of Example 6 of the embodiments of the Applicant's invention. It is one of the features of the Applicant's embodiments described in the Applicant's specification that these devices operate with a higher air pressure across the cathode side, creating greater compressive force on that side, and a greater tensile force on the other side of the electrolyte sheet. It is Applicants, not the cited references, who provide this teaching. It is in description of Applicant's embodiments. Other types of fuel cells may not have this feature. For example, as described in the Applicant's 9/30/05 Response to the Final Office Action of 8/11/05, the Badding reference (2001/0044043) describes a fuel cell device configuration that does not have this feature. Thus, it is not inherent that the electrolyte taught by Kato is arranged in the manner claimed by Applicants, nor is it inherent that it experiences the types of pressures taught and claimed by the Applicants.

As Examiner knows, a prima facie case of obviousness requires a suggestion or motivation to combine, a reasonable expectation of success, and a teaching or suggestion of all claim limitations. (MPEP §2143.) The teaching or suggestion to modify the Kato and McElroy references in a manner suggested by Examiner must be found in the prior art; the teaching or suggestion to modify cannot be found in Applicant's disclosure. "Our case law makes clear that the best defence against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references," In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). "There must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant." In re Dance, 160 F.3d 1339, 1343, 48 USPQ2d 1635, 1637 (Fed. Cir. 1998). "Teachings of references can be combined only if there is some suggestion or incentive to do so," (emphasis in original). In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988), quoting ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984).

"Even when the level of skill in the art is high, the Board must identify specifically the principle, known to one of ordinary skill that suggests the claimed combination. In other words, the Board must explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious," In re Rouffet, 149 F.3d 1350, 1359, 47 USPQ2d 1453, 1459 (Fed. Cir. 1998) "The examiner can satisfy the burden of showing obviousness of the combination 'only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references,'" In re Fritch, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992).

However, there is no suggestion in either the Kato, or in the McElroy reference to orient the electrolyte as claimed in claim 1, nor do these references provide a reason for doing so. Claims 4-12 depend from claim 1, and therefore explicitly incorporate the language of claim 1. Accordingly, claim 1 and 4-12 are not obvious over the cited art.

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Conclusion

Based upon the above amendments, remarks, and papers of records, applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Applicant believes that no extension of time is necessary to make this Reply timely. Should applicant be in error, applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

Please direct any questions or comments to Svetlana Z. Short at 607-974-0412.

Respectfully submitted,

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